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SIXTY-DAY AND KHERSON OATS.

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,

Washington, D. C., February 23, 1910.

SIR: I have the honor to transmit and to recommend for publication as a Farmers' Bulletin the accompanying manuscript, entitled "Sixty-Day and Kherson Oats," prepared by Mr. C. W. Warburton, Agronomist in Charge of Oat Investigations.

The value of early oats in the corn belt and in the Great Plains region, particularly in unfavorable seasons, has been fully demonstrated. Two varieties from southern Russia, one of which was introduced by this Department, have come into special prominence in this connection. The experience of a number of farmers, experiment-station workers, and others with these varieties is reviewed herein. The results shown should materially increase the popularity of early oats on corn-belt and dry-land farms.

Respectfully,

G. H. POWELL,
Acting Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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SIXTY-DAY AND KHERSON OATS.

INTRODUCTION.

Practically four-fifths of the oat crop of the United States is produced in the thirteen States extending from New York and Pennsylvania westward to North Dakota, South Dakota, Nebraska, and Kansas. Each of these States annually devotes more than a million acres to oats. The average yield in the six northernmost States, New York, Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota, is 31.68 bushels to the acre, while their total production is slightly less than one-third of the oat crop of this country. The average yield of the other seven States, Pennsylvania, Ohio, Indiana, Illinois, Iowa, Nebraska, and Kansas, is only 29.23 bushels to the acre, yet they produce more than half of the entire crop. The difference in yield of nearly two and one-half bushels to the acre between these two groups of States is due largely to the fact that the climatic conditions of the northern group are better suited to the production of the crop. There is no material difference in soil preparation or other influencing factors.

Oats are grown in the corn belt, which includes all the States of the second group, largely because a small-grain crop is needed in the rotation and because the grain is desired for feeding to work stock. Spring wheat is seldom satisfactory in this district, and winter crops often do not fit well into a rotation which ordinarily includes corn, a small grain, and grass. Under these conditions oats are generally grown as the best crop between corn and grass. This is particularly true in Illinois and Iowa, the two States producing the greatest quantity of both corn and oats.

THE NEED FOR EARLY OATS.

There are several factors which reduce the yield of oats in the corn belt. Poor preparation of the soil, unfavorable weather conditions, injury from rust and lodging, and the use of unsuitable varieties are among the most potent influences. All these deterrents, except poor preparation, may in a measure be overcome by the sowing of varieties better suited to the conditions of the section where they are grown. In general, those best adapted to the corn belt are those which mature earliest, for early maturity often enables a crop

to escape the hot weather, injury from storms, and the attacks of plant diseases. The early varieties also usually produce less straw, and for that reason are less likely to lodge than the ranker growing late varieties. A number of years ago the Early Champion and the Fourth of July varieties came into prominence, but they are not now extensively grown, for, although early in maturing, their yield is often unsatisfactory. Burt is a very early variety much used for spring seeding south of the Ohio River but little known elsewhere. The type of early oats now most largely grown in this country is represented by the Sixty-Day and the Kherson varieties, two comparatively recent introductions from Europe. Their adaptation to our conditions is discussed in this bulletin.

HISTORY OF KHERSON AND SIXTY-DAY OATS.

Most of the varieties of oats now grown in the northern half of the United States came originally from northern Europe or have been produced from varieties from that section. Our great central valleys are, however, subject to high summer temperatures not found in the more equable climate of northern Europe, and for that reason the varieties of oats from Germany, Sweden, and similar European sources have not been altogether satisfactory in our corn belt. Conditions more nearly approaching our fertile prairie sections are found in the chernozém or "black-earth" district of southern Russia. This district is one of wide extremes of heat and cold, with rather low rainfall. The hot summer and rich soil make it comparable with the corn belt, and though the rainfall is lower it is readily seen that varieties of grain of value there are likely to prove desirable over a large portion of the United States.

The Nebraska Agricultural Experiment Station^a secured seed of an early variety of oats from this section in 1896 through Prof. F. W. Taylor, then superintendent of farmers' institutes in Nebraska, who obtained it in the course of a journey through Russia. This seed was sent out under the name Kherson, that of the district from which it came. It was quite widely distributed in Nebraska, but for several years was little known outside that State. In March, 1901, an importation of a similar variety was received by the United States Department of Agriculture from Mr. C. I. Mrozinski, of Proskurov, in the Podolia government of Russia.^b This province lies just west of the Kherson government and its climatic and soil conditions are much the same. This variety was received as "Sixty-Day" and has been widely distributed under this name. It closely

^a Bulletin 84, Nebraska Agricultural Experiment Station.

^b Bulletin 66, Bureau of Plant Industry, U. S. Dept. of Agriculture, S. P. I. No. 5938.

resembles the Kherson and is practically identical with it, although under the same conditions there is sometimes considerable variation in yield.

DESCRIPTION OF KHERSON AND SIXTY-DAY OATS.

The two varieties Sixty-Day and Kherson are so similar in appearance that the same description may be applied to both. The plant is a vigorous but not rank grower, usually less inclined to lodge than varieties with coarser straw. The head, or panicle, is loose and spreading, bearing a large number of grains. The grain is small to medium in size, long, and rather slender, but, under favorable conditions, plump and well filled. Heads of Sixty-Day oats are shown in figure 1, while figure 2 shows heads of this and of two other varieties imported by the United States Department of Agriculture. The color of the Sixty-Day and the Kherson oats varies with the locality. In the corn belt the grain is a deep golden yellow, while farther north and in drier sections it is much paler, becoming almost white in the extreme West and Northwest. The hull is very thin and the weight per bushel usually high. The crop ordinarily reaches maturity in 90 to 100 days, or about 10 days earlier than most of the varieties commonly grown.



FIG. 1.—Heads of Sixty-Day oats.

DESIRABLE AND UNDESIRABLE CHARACTERS.

The principal objections urged by farmers against this class of oats are the yellow color and the small size of the berry. In some markets there is a discrimination in favor of white oats of 1 or 2 cents a bushel, but by far the larger portion of our oat crop is fed on the farms where produced, and yellow oats are just as good for feeding as those of any other color. On the other hand, on account of its

thin hull this particular type of oats is higher in feeding value than are most other varieties. In tests made some years ago by the writer in which samples of a number of varieties from Wisconsin, North Dakota, Kansas, and Montana were examined, the Kherson and the Sixty-Day oats ranked highest in the proportion of kernel to whole grain in every case. The highest percentage recorded was 78.07, from a sample of Kherson grown in Wisconsin in 1905, while the lowest was 54.86, from a sample of white oats grown in the same State the following year. Kherson and Sixty-Day oats grown under exactly the same conditions as this latter sample showed more than 70 per cent of kernel. The average of 12 samples of these two

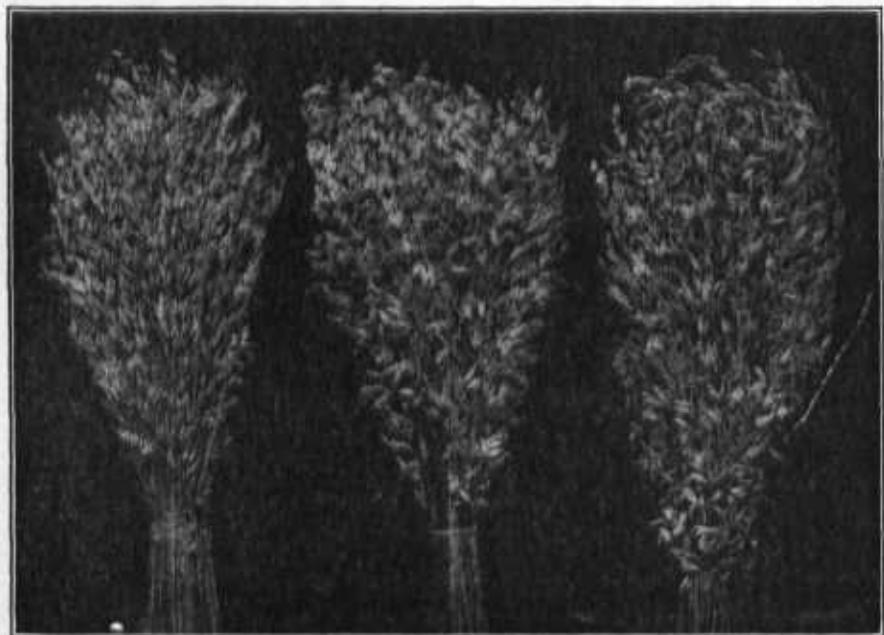


FIG. 2.—Heads of three varieties of oats imported by the United States Department of Agriculture, the Sixty-Day on the left, the Swedish Select in the center, and the North Finnish Black on the right.

varieties showed 73.3 per cent of kernel, while 39 samples of other varieties showed 69.2 per cent. On this basis, where ordinary oats are worth 50 cents a bushel for feeding, the Sixty-Day and the Kherson are worth 53 cents. Frequently the difference in favor of the latter varieties is even greater. The North Dakota Agricultural Experiment Station says that on account of its thin hull the Sixty-Day is worth 4 or 5 cents more a bushel for feeding than some other varieties.^a A comparison of the grain of Sixty-Day and that of

^a Bulletin 79, North Dakota Agricultural Experiment Station, p. 481.

Swedish Select, a medium-late, large-grained oat now very popular in the Northern States, is shown in figure 3. The weight of 1,000 grains of this sample of Swedish Select was nearly one and one-half times that of the same number of grains of the Sixty-Day sample, but the proportion of kernel to hull was considerably larger in the latter.

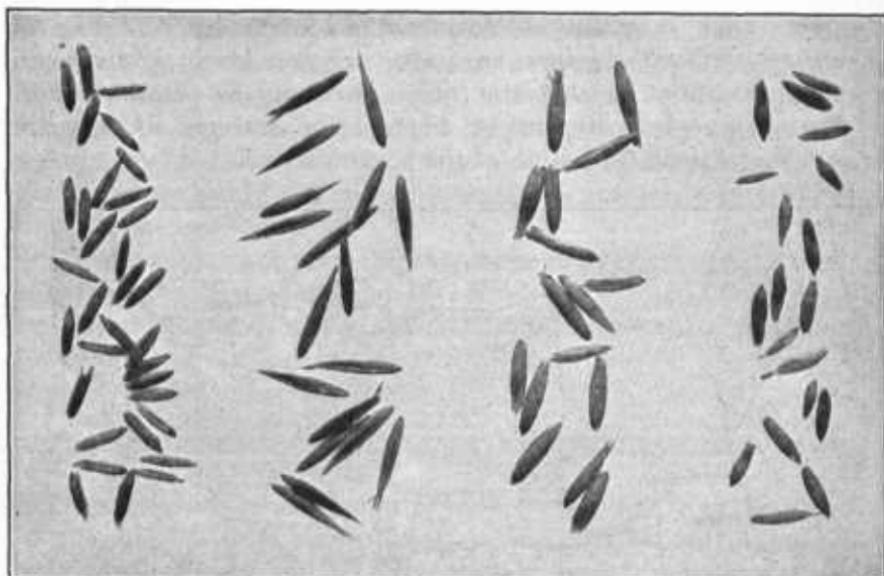


FIG. 3.—Grains of the Sixty-Day (left half) and the Swedish Select oats (right half) with and without hulls. The sample of Sixty-Day contains 73.5 per cent of kernel, while that of Swedish Select contains but 69 per cent.

The following table shows the chemical composition of the Sixty-Day oats as compared with the Swedish Select, the North Finnish Black, the Burt, the Rustproof, and 72 miscellaneous samples.

TABLE I.—*Results of analyses of oat varieties, showing percentage of water and the number of pounds of ash, protein, etc., in 100 pounds of water-free substance.^a*

Variety.	Number of sam- ples ana- lyzed.	Per cent of water.	Pounds in 100 pounds of dry matter.				
			Ash.	Protein.	Fat.	Crude fiber.	Carbohy- drates.
Sixty-Day	39	8.90	3.94	14.69	3.89	11.00	66.55
Swedish Select	128	7.10	3.90	12.85	4.00	12.23	66.99
North Finnish Black	12	8.76	4.00	12.10	4.89	13.32	65.67
Burt	7	8.56	4.37	14.34	6.21	11.41	63.67
Rustproof	8	7.74	3.75	13.32	4.61	11.60	65.72
Miscellaneous	72	9.96	3.72	13.40	4.91	13.24	64.73

^a Bulletin 120, Bureau of Chemistry, U. S. Dept. of Agriculture. The 72 miscellaneous samples were grown in the United States and Canada and were analyzed at the World's Columbian Exposition in Chicago in 1893.

The feeding value of the Sixty-Day oat is well shown in this table. The chemical analyses bear out the statements previously made regarding the small proportion of hull. The high protein content and the small amount of crude fiber are especially worthy of note.

In some sections the Kherson and the Sixty-Day oats mature at the same time as winter wheat, and for that reason are not popular, though by some the fact that they can be harvested and thrashed at the same time as wheat is considered an advantage. This early thrashing enables the grower to market his oats ahead of the main crop, sometimes at much better prices than can be obtained later. In the spring-wheat district or where large acreages of oats are grown, they extend the length of the harvest season.

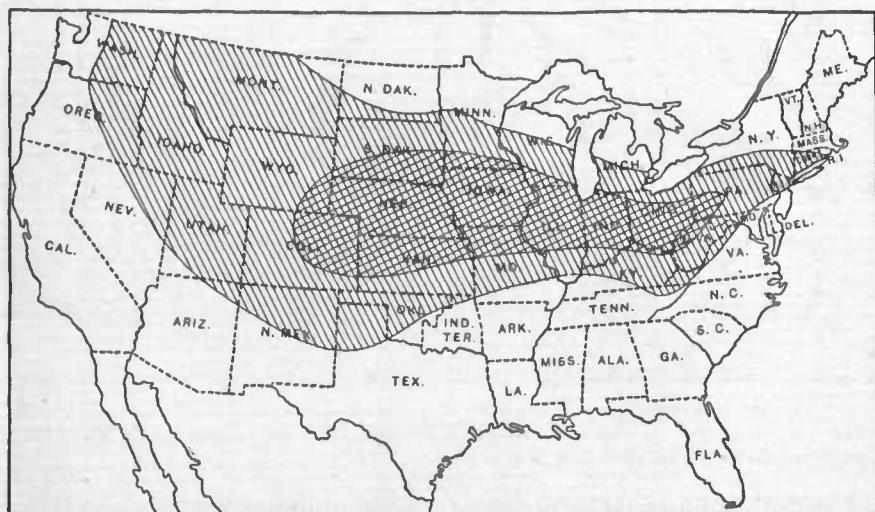


FIG. 4.—Map of the United States, the shaded portion showing the area to which the Sixty-Day and the Kherson oats are adapted. The heavily shaded portion shows the region where the best results are likely to be obtained with these varieties.

On account of their short straw and early maturity they are among the best varieties for use as nurse crops. Their yield of straw is less than that of most other varieties, so that where a large quantity of roughage is desired this type of oats is not to be recommended. The straw is of excellent quality, however, and is readily eaten by stock.

Less seed can be used than of the large-grained varieties. Seeding at the rate of 2 bushels to the acre is sufficient where $2\frac{1}{2}$ bushels is the ordinary rate.

ADAPTABILITY TO VARIOUS SECTIONS.

While neither the Kherson nor the Sixty-Day oat has yet been tested over the entire oat-growing area, they have been distributed

widely enough to give a good idea of their adaptability. They probably have a wider range than any other variety. The States where best results may be expected include those of greatest acreage—Pennsylvania, Ohio, Indiana, Illinois, Iowa, Nebraska, northern Kansas and Missouri, southern Wisconsin and Minnesota, South Dakota, and eastern North Dakota. They are particularly to be recommended in Illinois, Iowa, and Nebraska. Indiana reports have been rather unfavorable. Good returns have been obtained under dry-farming conditions in Montana, Wyoming, Colorado, New Mexico, Utah, Idaho, Washington, and Oregon. Where water for irrigation is available some of the larger grained later varieties will usually give heavier yields. This is also true in the northern tier of States, where conditions are more favorable to the late varieties than they are farther south.

The accompanying map (fig. 4) shows approximately the sections to which the Sixty-Day and the Kherson oats are adapted. The heavily shaded area shows the district in which these varieties are likely to prove most successful and, in a general way, where they will largely replace other varieties.

RESULTS OBTAINED BY EXPERIMENTERS.

The statements which follow have been compiled from the bulletins of the various state agricultural experiment stations, unpublished correspondence and reports from these stations, the reports of cooperative and other stations maintained wholly or in part by the Bureau of Plant Industry of the United States Department of Agriculture, correspondence with seed dealers, and the reports of farmer cooperators.

TESTS IN THE EASTERN STATES.

Maryland.—Few tests of the Sixty-Day and the Kherson oats have been made in the Eastern States. Soon after its introduction Sixty-Day was grown for two or three years at the Maryland station, where it gave as good yields as Burt and Rustproof. As winter oats usually give much better returns than spring varieties at this station, the growing of the latter was discontinued about 1905. From the results secured previous to this time it would appear that Sixty-Day is as well adapted to spring seeding in Maryland as are Burt and Rustproof.

Pennsylvania.—Prof. F. D. Gardner, of the Pennsylvania station, reports that the Sixty-Day was the highest yielding oat in a three-year test, from 1907 to 1909, in which twenty-three varieties were included. The average yield was 58.9 bushels to the acre, only slightly higher than that of Joancette, Big Four, Japan, and Lincoln,

which ranked in the order given. The average weight per bushel of Sixty-Day was 32.1 pounds, and the average yield of straw, 2,252 pounds to the acre. The average yield of all the varieties for the three years was 54.9 bushels of grain and 2,662 pounds of straw. Sixty-Day ripened 8 or 10 days earlier than most of the other varieties, but is objectionable on account of its low yield of straw and its appearance. Kherson has been tested but one year, 1909, when it gave the highest yield of the twenty-four varieties tested—63.6 bushels.

New York.—Neither of the varieties under discussion has been included in the field tests at the New York (Cornell) station, but a number of Sixty-Day selections have been included in the plant-nursery work, where they have made an excellent showing. In general, however, conditions in New York are more favorable to the growth of the larger later varieties than to those of the Sixty-Day type.

TESTS IN THE NORTH-CENTRAL STATES.

Ohio.—At the Ohio station the Sixty-Day oat ranks second among the fifty or sixty varieties under test, with an average yield of 69.75 bushels to the acre for the six years from 1904 to 1909. For the same period Siberian averages nearly 1 bushel to the acre more, while the yield of Improved American almost equals that of Sixty-Day. The weight per bushel of Sixty-Day and of Improved American is practically the same, about 26.25 pounds, while Siberian is nearly 1.5 pounds heavier, averaging 27.67 pounds. Kherson has not been tested at this station. Prof. C. G. Williams, the agronomist, writes that Sixty-Day is the earliest oat under test there, and in unfavorable seasons, such as have recently occurred, it matures, to some extent at least, ahead of the plant diseases which severely injure some of the later varieties. His greatest objection to the variety is its rather weak straw^a which, he says, is not worse than that of a number of others, but notably weaker than Improved American.

Indiana.—The report from the Indiana station is the only unfavorable one from the corn belt. The average yield of the Kherson oat for the five years 1904 to 1908 was 41.66 bushels; of Sixty-Day, 44.86 bushels; of Great Dakota (the leading variety), 55.02 bushels, and of Silvermine, 52.2 bushels. Sixty-Day ranked twentieth and Kherson thirty-first in an average number of thirty-seven varieties

^a This opinion regarding the strength of straw of this variety is not the one commonly held. Its apparent resistance to lodging is, however, more largely due to its early maturity, which often enables it to escape storms, than to other causes.

under test. The weak points of both varieties, according to Professor Wiancko, are the low yield, the color of the grain, and the low weight per bushel. The only conditions, in his opinion, under which these varieties are likely to be of value in Indiana are where it is desirable to get the crop off the land early, where late seeding is necessary, or where the large-growing varieties are apt to lodge. The two varieties are very similar in their general characteristics, habits of growth, strength of straw, and quality of grain.

John Waters, of Decatur County, reports that the Sixty-Day oat yields as well as any variety in his neighborhood. He states that if sown as early as the ground can be worked in the spring this variety will mature early enough to be harvested and thrashed with wheat, which he considers a strong point in its favor.

Michigan.—Both the Sixty-Day and the Kherson oats have been grown for three years at the Michigan station. No definite figures of the results have been published, but Professor Spragg writes, "We are still retaining them, but consider them decidedly lower in yield than certain later varieties."

G. F. Ottmar, of Clinton County, who has grown Sixty-Day for several years, writes under date of August 24, 1909, "I still raise the Sixty-Day oat and find it the best oat ever introduced into this State."

TESTS SOUTH OF THE OHIO RIVER.

The varieties here discussed have not been grown in field tests at any of the agricultural experiment stations in the section south of the Ohio River except that of Tennessee.

Kentucky.—At the Kentucky station a number of pedigreed selections of the Sixty-Day oat have been grown in the nursery for three years in comparison with similar selections of other varieties and of hybrids, all the selections having been furnished by the Bureau of Plant Industry of this Department. The best showing has been made by selections of a hybrid between Sixty-Day and Burt and by the Sixty-Day strains. While the results thus far secured hardly justify conclusions, it is probable that Sixty-Day and Kherson will yield as well as other spring varieties, particularly in the eastern portion of the State.

Tennessee.—Kherson oats on upland at the Tennessee station have made an average yield in the four years 1906 to 1909 of 31.78 bushels of grain and 0.8 ton of straw, as compared with 26.25 bushels of grain and 0.69 ton of straw produced by Burt. In the two years 1908 and 1909 Kherson has averaged 27.95 bushels; Burt, 23.75 bushels, and Red Rustproof, 22 bushels. A test of these three varie-

ties on bottom land in 1908 was also favorable to Kherson. Prof. C. A. Mooers, agronomist of this station, writes as follows:

I have not seen any difference between Kherson and Sixty-Day, and have grown both kinds for the past few years. The Burt is the nearest rival and is quite extensively grown in the best farming sections of middle Tennessee. Red Rustproof is the common spring oat in east Tennessee, and also in some other parts of the State. I am rather surprised at the favorable showing of the Kherson as compared with the others.

TESTS IN THE UPPER MISSISSIPPI VALLEY.

Illinois.—At the Illinois station the Sixty-Day oat has given an average yield of 53.1 bushels for the five years from 1905 to 1909, as compared with a general average of about 45 bushels for the medium-early varieties under test. The average of the best yielding varieties other than Sixty-Day or Kherson for the five years was practically the same as that of Sixty-Day, 53.2 bushels. In no case, however, did any one variety occupy this position for more than one of the five years. In 1907 and 1908 Sixty-Day gave the highest yield of any variety under test. Kherson has been grown for a shorter period than Sixty-Day and has given an average yield of 54.5 bushels. Prof. O. D. Center, of this station, says:

The Illinois farmer is confronted with conditions that make it imperative to adopt one of two measures; either he must increase the humus and organic-matter content of his soil, thus providing a reservoir for moisture during a critical period in the development of the oat plant peculiar to Illinois conditions, or else he must adopt the plan of growing an earlier-maturing variety of grain. For best results the first solution of the problem is far superior to the last, since he will not only secure better yields of oats, but he will be increasing the productive power of his soil for other crops as well.

Mr. Samuel Ray, of Ogle County, received 2 bushels of Sixty-Day oats from this Department in 1905. This seed was sown on 1 acre and produced 83 bushels. The following year his yield was 72 bushels to the acre from 8 acres, sown at the rate of $1\frac{1}{2}$ bushels to the acre. In 1907 the average yield secured was 65 bushels; in 1908, 50 bushels, and in 1909, 83 bushels. The average yield for the five years is 69.6 bushels.

A dealer in farm seeds near Chicago writes as follows:

I recommend Sixty-Day oats for seeding as a nurse crop and in regions where larger and longer season varieties will not escape rust. During 1907 and 1908 these early oats gave very general satisfaction, but in a season like 1909, when the big oats pan out so well, the Sixty-Day oats do not give the satisfaction that I would like to have them. They grow a rather short, slender straw, and while I do not consider that an objection to them, many stockmen do, as they want considerable straw for feeding, and make that quite a feature of the crop. Sixty-Day oats have a place all through the central and northern oat belts, and I believe can be depended on to produce a crop under harder conditions than Swedish Select, Big Four, or like varieties.

The dealer quoted states, further, that a grower near Jerseyville, Ill., pronounces Sixty-Day oats splendidly adapted to that section; one near Luceerne, Ind., likes them there, and a South Dakota farmer reports a yield of 81 bushels to the acre in 1909, testing 40 pounds to the bushel.

Wisconsin.—At the Wisconsin station both the Sixty-Day and the Kherson oats have been tested since 1906. The average yield of Kherson for four years has been 56.4 bushels; of Sixty-Day, 58.3 bushels; of Silvermine, 44.2 bushels, and of American Banner, 40.4 bushels. Kherson averaged 29 pounds per bushel in weight; Sixty-Day, 28.8 pounds; Silvermine, 26.7 pounds, and American Banner, 23.2 pounds. All these figures include the year 1907, when the oat crop at this station was severely damaged by storms, the injury to the late varieties being greater than to the early ones. Swedish Select, which in the preceding four years, 1902 to 1905, was the leading variety, has averaged less than 40 bushels for the last four years.

In a recent letter Professor Moore, the agronomist, says:

We have not up to the present time been able to see any difference between the Kherson and Sixty-Day oats and think they are one and the same variety. We find them good yielders, early in maturity, and heavy in weight per measured bushel. They are an exceedingly poor-looking oat and considerable comment is often made on them by farmers on account of their general looks. This, however, will be overcome after farmers know that this particular oat has a place in oat culture that no other variety so far has been able to take. That is, especially on rich, low ground, where most varieties rust and lodge extensively.

A Wisconsin dealer writes:

We consider Kherson a desirable variety for some sections, especially for black prairie soils where other oats usually will not stand up. It is not an attractive looking oat and does not sell readily from sample. In fact, we doubt if it ever becomes popular as a market oat.

Minnesota.—At the Minnesota station, in a comparison with Early Gothland (Minn. No. 26) and Improved Ligowo (Minn. No. 6) the average yield of Sixty-Day oats for the eight years from 1902 to 1909 was 67.6 bushels, while that of Early Gothland was 68.52 bushels and of Improved Ligowo 57.33 bushels. For the six years from 1904 to 1909 Sixty-Day is slightly in the lead, with an average yield of 63.78 bushels, as compared with 63.14 bushels for Early Gothland. A nursery selection of American Banner has a six-year average of 61.84 bushels. Kherson has been grown but four years at this station, the average yield being 56.74 bushels. The selection of American Banner just mentioned (No. 312) leads for this period, with 60.29 bushels, while Sixty-Day averages 58.03 and Early Gothland 55.76 bushels.

Prof. Andrew Boss, of this station, makes the following statement:

The early oats, both the Sixty-Day and the Kherson, are becoming quite popular in Minnesota, especially during the years when the rust has been severe. The strong points of these varieties are early maturity and yielding quality. The weak points are short straw, a slight tendency to lodge, though possibly not worse in this respect than many of the other varieties, and the fact that they are poor commercial varieties. Both are small kernelled and yellow in color, points which militate against them on the market. For home consumption I hear of very little objection to them. With the exception of the present year, the Sixty-Day oat has stood up remarkably well. We grew a large field of this variety this year and it lodged very badly. Since, however, the oats were headed out fully at the time of a very severe storm when other varieties of oats were not, I have attributed their lodging this year to the storm rather than to any natural tendency along that line.

A member of a prominent Minneapolis seed firm states that his firm has not found the Sixty-Day or the Kherson oats in demand or worthy of general distribution in his section of the Northwest. He further states:

We believe they are especially adapted to the corn-growing belt, where oats are inclined to rust and blight on account of hot weather, which is quite sure to injure the late varieties when maturing. They always sell at a discount on account of their color; hence, are not desirable on the market.

Iowa.—Early oats have made a particularly good showing at the Iowa station. In a five-year test, from 1905 to 1909, four early varieties, ripening on or before July 16, averaged 46 bushels to the acre, eleven medium ones, ripening between July 16 and 25, averaged 43.5 bushels, and five late varieties, ripening after July 25, averaged 38.8 bushels. The highest yielding variety was Kherson, with an average of 55.1 bushels to the acre; Silvermine, which ripened eight days later, was next with 51.1 bushels, and Swedish Select, ripening with Silvermine, was third, with 47 bushels. Sixty-Day ranked sixth among the twenty varieties under test, with a yield of 45.2 bushels. Kherson was highest in weight per bushel, with 30.25 pounds. The growing of early varieties of oats is more essential in central and southern Iowa than in the northern portion of the State.

TESTS IN THE NORTHERN GREAT PLAINS STATES.

North Dakota.—The Sixty-Day oat has been grown at the North Dakota station since its introduction in 1901. A field of this variety at this station is shown in figure 5. Heavy rains during harvest caused the loss of the variety test in 1905, and floods early in the season destroyed it in 1909, so that only the yields from 1901 to 1904 and from 1906 to 1908 are available. The average yield of Sixty-Day for these seven years is 63.5 bushels, while that of Tartarian, a late side oat which ranks next to Sixty-Day, is 60.8 bushels. Other

Varieties which have yielded slightly less than Tartarian are Abundancee, Siberian, and Lincoln. Seventyfive-Day, a variety quite similar to Sixty-Day, from the same grower as that variety, Mr. Mrozinski, has been grown at the station since 1902. Its average yield for the six years from 1902 to 1904 and from 1906 to 1908 has been 74.32 bushels to the acre, as compared with 65.7 bushels from Sixty-Day and 63.6 from Tartarian for the same period. The Seventyfive-Day oat is evidently one which could be grown to advantage in the Red River Valley.

At the Edgeley substation the highest yielding variety has been Abundancee, with an average of 53.6 bushels in a five-year test, from 1905 to 1909. Siberian ranks next in order, with 51.8 bushels, while Sixty-Day is third, with 48.2 bushels. Silvermine has yielded practically as well as Sixty-Day, while the yield of Kherson, which has



FIG. 5.—Field of Sixty-Day oats at the North Dakota Agricultural Experiment Station, Agricultural College, N. Dak.

been grown only since 1906, is slightly less than that of Silvermine. All the varieties mentioned, however, yield better than either White Russian or Tartarian, which are varieties commonly grown in the section of North Dakota around Edgeley.

At the Dickinson substation the leading variety in a test covering three years, 1907 to 1909, has been Early Mountain, with an average yield of 69.22 bushels. Next in order are No. 386, an unnamed variety from Germany very similar to Early Mountain, with a yield of 68.8 bushels, and Kherson, with 68.22 bushels. White Tartarian has averaged 63.23 bushels and Banner 59.25 bushels for a similar period. The highest yielding variety for the two years 1908 and 1909 was Golden Rain, recently imported from Sweden, with an aver-

age yield of 67.5 bushels. The yield of Sixty-Day at this station has been very much lower than that of Kherson.

At the recently established substation at Williston, Silvermine is the leading variety, averaging 70.4 bushels for the two years 1908 and 1909. Ligowo, Siberian, and Probsteier follow in order, while Sixty-Day ranks fifteenth among twenty-one varieties under test, with an average yield of 52.6 bushels. These results were secured without irrigation. Kherson has not been included in the tests, but it is hardly probable that these early varieties will ever rank high in yield in this section. They are certainly not to be recommended on irrigated farms, but may make a favorable showing outside the irrigated district in dry seasons.

South Dakota.—The leading variety at the South Dakota station ^a for the three years from 1906 to 1908 was the Red Algerian oat, a variety of the Rustproof type originally from northern Africa, with a yield of 51.7 bushels, while the Kherson and the Sixty-Day averaged 49.1 and 48.4 bushels, respectively. The average weight per bushel of Red Algerian was 28.75 pounds; of Kherson, 27.8 pounds, and of Sixty-Day, 25.58 pounds. In a longer test, embracing the six years from 1904 to 1909, Sixty-Day averaged 59.4 bushels; Swedish Select, 44.7 bushels; North Finnish Black, 40 bushels; and Banner, 27.6 bushels. Kherson and Red Algerian were not included in the tests previous to 1906. In a recent publication ^b Professor Willis says, "Of all varieties grown at this station, Sixty-Day has proven the best."

At the Highmore substation Swedish Select has outyielded Sixty-Day about 4 bushels to the acre in a seven-year test, from 1903 to 1909, while in a four-year test, from 1906 to 1909, Kherson leads with a yield of 41.5 bushels; Swedish Select is second, with 41.3 bushels, and Sixty-Day third, with 37.8 bushels. The results are not strictly comparable, however, as in 1906 Sixty-Day was not grown in the regular series. Instead, it was grown after sorghum and gave a yield of 43.3 bushels. Kherson in the regular series yielded 69.7 bushels, and Swedish Select 65 bushels, while the latter on sorghum ground yielded but 42.8 bushels, or practically the same as Sixty-Day. It is probable that if Sixty-Day had been grown under the same conditions as the other varieties in 1906 its average yield for the four-year period would have been as good as either Swedish Select or Kherson.

At the recently established experiment farm at Bellefourche, the average yields for 1908 and 1909 of the Kherson and the Sixty-Day oats were practically the same, 36.4 and 36.3 bushels, respectively, while the Swedish Select averaged 33.3 bushels, and only one other

^a Bulletin 110, South Dakota Agricultural Experiment Station, p. 434.

^b Op. cit., p. 423.

variety yielded more than 30 bushels. The average weight per bushel of the Sixty-Day and Kherson was 33.8 pounds, while Swedish Select averaged 34.3 pounds. These figures are from nonirrigated plats. It is probable that Swedish Select will be the better variety to grow on irrigated land in this section. On the dry farms in the vicinity of both Highmore and Bellefourche, Sixty-Day and Kherson are also to be recommended, though in dry years they may not grow tall enough to be cut with the binder.

The manager for a South Dakota seed firm reports that practically all the oats sold by his firm in 1909 were of the Sixty-Day variety, due to its superiority the previous year and to published reports of its value as compared with later varieties. In the 1909 catalogue of this firm the following statement is made:

It is adapted to the widest range of soil and climate of any oat grown in the United States to-day. It is the earliest of all oats. It gets out of the way of rust, drought, hailstorms, and hot winds.

Isaac Lincoln, of Brown County, has grown the Sixty-Day oat since its introduction. His average crop from 1902 to 1908 was 89 acres, with an average yield of 61.6 bushels to the acre. He states that in his locality the variety ripens in from ninety-three to one hundred days, or from one to three weeks earlier than other varieties, thus escaping rust, drought, and summer storms.

A large landowner near Manchester, Kingsbury County, writes that he has grown Sixty-Day oats for several years and that while he has no definite records he believes that the lowest yield under average conditions has been about 40 bushels. The average yield of more than 200 acres for 1909 was about 40 bushels by measure, or considerably more than that by weight.

G. A. Grant, of Minnehaha County, has been growing the Sixty-Day oat since 1901, with an average yield of about 50 bushels during that time. He states that owing to the light straw of this variety it takes less twine to harvest it, but he advises the use of small bundles and small shocks, as he finds it hard to cure. While grain dealers do not like it and pay 1 or 2 cents a bushel less than for white oats, he thinks it worth more for feed than other varieties,

H. H. Stoner, of Hyde County, states that early oats like the Kherson and the Sixty-Day, both of which he grew in 1909, are likely to escape the dry weather which usually comes in that section during the latter part of July and early in August, and that they will almost invariably give better yields than the later varieties. His yield of Sixty-Day was 51 bushels; of Kherson, 56 bushels; and of Swedish Select, 39 bushels. The Swedish Select weighed 35 pounds to the bushel, about 2 pounds less than the early varieties.

Nebraska.—For the seven years from 1902 to 1908 the Kherson oat has been the leading variety at the Nebraska station,^a with an average yield of 55.3 bushels. The yield of Sixty-Day has been slightly less, 52.5 bushels, while Texas Red has averaged 52 bushels. Burt, which was tested but four years, 1905 to 1908, averaged about 4.5 bushels more than Kherson for that period and matured four days earlier. The average date of harvesting for Kherson and Sixty-Day was July 10, and for Texas Red, July 15. The superiority of early oats over late ones in the section of Nebraska around Lincoln is well shown by a comparison of yields. Of the varieties which have been grown four years or more, the five which were harvested on or before July 15 averaged 53.9 bushels per acre, while the seven varieties ripening after that time averaged 40.1 bushels.

At the North Platte substation Kherson is the leading variety, although Burt and Texas Red are close rivals. Sixty-Day is considered as identical with Kherson. The latter variety averaged slightly better than 40 bushels to the acre from 1904 to 1908, with the year 1907, when the entire oat crop was killed by a late frost, excluded. Kherson is recommended as the best oat for western Nebraska.^b

A prominent Nebraska seed firm writes that practically four-fifths of its oat sales in the past three years have been of the Kherson variety, and that there has also been a large trade among farmers in this oat. This firm especially recommends the Kherson for growing on heavy soil and low ground, stating that it stands up much better and yields more than other varieties.

TESTS IN THE SOUTHERN GREAT PLAINS STATES.

Kansas.—At the Kansas station the three leading varieties in a test covering the six years from 1904 to 1909 have been the Red Texas, with an average yield of 43.5 bushels, the Sixty-Day, averaging 41.79 bushels, and the Kherson, averaging 41.43 bushels. The highest yield in this test was secured in 1909 from the Sixty-Day, 66.32 bushels to the acre.

Concerning the Kherson and the Sixty-Day oats, Professor Ten Eyck writes:

It appears that the Kherson oat is somewhat more generally adapted for growing in the State than the Sixty-Day variety, although there is really very little difference in these varieties either in appearance or in yields or hardiness. These varieties are somewhat better adapted for growing in the northern and western parts of the State than the Red Texas. At this station, however, and through the central, southern, and eastern portions of the State the Red Texas

^a See Bulletin 113, Nebraska Agricultural Experiment Station.

^b Bulletin 109, Nebraska Agricultural Experiment Station, pp. 21, 22.

oats should generally be preferred. An advantage of the Kherson on fertile soil is that it does not make a very rank growth of straw and is not apt to lodge. On the other hand, on poor land or in dry seasons the Kherson and Sixty-Day may not grow high enough to harvest well. Another fault with these oats is the small berry. Farmers prefer a larger grain. Their earliness makes Kherson and Sixty-Day somewhat safer for growing in central and western Kansas than later maturing sorts. In eastern and northern Kansas the early-maturing varieties usually rust less than those that mature later. Early oats have an advantage in Kansas in that they mature before hot weather. The Red Texas is only a few days later than the Kherson and is not at much disadvantage in this respect. These varieties are easily the best producers and the safest for planting in Kansas.

At the McPherson cooperative station the average yield of Kherson and Sixty-Day oats for the four years from 1906 to 1909 has been about 38 bushels to the acre, while various strains of Red Rustproof and Burt gave yields averaging from 1 to 5 bushels less. These figures include the 1907 crop, when all varieties of oats were practically a total failure at this station.

Oklahoma.—The Kherson oat has been grown for five years at the Oklahoma station, where it has given practically as good yields as Red Rustproof. Sixty-Day has been grown only two years, but has made an excellent showing for that time. Mr. Burlison, of this station, says of the variety trials:

It seems from the experimental data thus far collected that the Kherson is one of the best two varieties of oats which we have tested. A large number of variety trials have been made comparing Texas Red and Kherson oats with other strains from different States. Taking all the work into account Texas Red and Kherson stand at the head of the list.

Texas.—Variety trials in the Panhandle section of Texas, conducted by the Office of Grain Investigations of the Bureau of Plant Industry from 1904 to 1906 at Channing and since that date at Amarillo, show Sixty-Day to be the highest yielding oat, slightly better than Red Rustproof. Kherson has been tested at Amarillo only, where it has given a yield materially lower than Red Rustproof.

New Mexico.—Few tests have been made of either the Sixty-Day or the Kherson oats in New Mexico. E. P. Barela, of Bernalillo County, has grown Sixty-Day for the past three years and has secured a good crop each year. This variety, in his opinion, is more drought resistant than those commonly grown in the vicinity.

TESTS IN THE MOUNTAIN AND PACIFIC NORTHWEST STATES.

Montana.—As previously stated, the larger, later varieties usually yield heavier on irrigated land than the Sixty-Day or the Kherson. A five-year test under irrigation at the Montana station at Bozeman shows an average yield of 82 bushels to the acre from Kherson and

78.8 bushels from Sixty-Day, while Progress, a large white oat similar to Swedish Select, averaged 93.1 bushels for the same period. The yield of straw from Progress was slightly heavier than from the other varieties. Professor Atkinson, of this station, says that Sixty-Day is the best yielding dry-farm oat in Montana, but neither this variety nor Kherson is considered especially valuable for the irrigated farm. An especially favorable season in 1909 following a very unfavorable one the previous year at the Judith Basin substation at Philbrook, established in 1908, resulted in an average yield for the two years of 52.4 bushels for Sixty-Day, 50.5 bushels for Kherson, 46 bushels for Swedish Select, and 43 bushels for White Russian.

Wyoming.—Prof. L. B. McWethy, of the Wyoming station, writes as follows:

The Kherson oat has been grown at this station for at least three years. Its earliness and resistance to drought and severe weather conditions, combined with good yielding qualities, make this oat a valuable one for high altitudes in this State. The objections to this variety are its short straw and the yellow color of the grain, which place it somewhat at a disadvantage as an oat for the market. Under more favorable conditions, where the water supply is sufficient, there are other varieties of oats superior to the Kherson or Sixty-Day.

Colorado.—The Sixty-Day and the Kherson oats have not been included in the variety trials at the Colorado station for a sufficient length of time to secure conclusive results. Prof. Alvin Keyser, the agronomist, states that Kherson is proving a good oat for dry-farming conditions on the plains of the State and is also showing up extremely well in the higher altitudes of the mountain parks, where its early ripening habit makes it of particular value.

At the Akron substation, tests in 1908 and 1909 showed Colorado No. 37 to be the highest oat in yield, averaging 54.2 bushels to the acre. The yield of Swedish Select was slightly lower, while Kherson averaged 45.6 bushels and Sixty-Day but 38.65 bushels. In 1909 the early varieties were injured more severely than the later ones by both drought and hail, which accounts for their low average yield. Kherson was the highest yielding variety at Akron in 1908 and will probably prove its value in a test extending over several years.

H. C. Walker, of Montrose County, who has grown the Sixty-Day oat for three years, reports that it is better than any other variety ever grown in his section. He further states:

This variety of oats is well suited to this climate and altitude. It stands up well and the grain has large kernels and thin husks. The yield is not as large as black oats but the feed value is far better.

Idaho.—The Idaho station has not grown the varieties here discussed, but a number of farmers have tested the Sixty-Day oat. As in other States, where irrigation is possible, larger later varieties give

greater yields, but on the dry farms Sixty-Day and Kherson are sure to find favor. Joseph S. Rudd, of Fremont County, says:

Sixty-four pounds of the Sixty-Day oat received from the Department, planted on one acre, produced 90 bushels. This variety is becoming a favorite on the dry farms because of its early maturity and the making of an average yield of 50 bushels to the acre. The only weak point that I have discovered in these oats is that they only weigh about 35 pounds to the measured bushel while some others weigh about 40 pounds.

F. R. Fouch, of Canyon County, tried the Sixty-Day oat for three years and discontinued it, stating that it was from 18 to 22 days earlier than the Danish Island but did not yield as well, was not as heavy, and shattered more. He further says that in case of a short water supply Sixty-Day would probably be the most satisfactory variety to grow.

F. W. Boehme, of Bear Lake County, is very enthusiastic over the Sixty-Day oat, stating that no other variety can take its place and that it is the best oat for the dry-farming section. The yield in his section is from 24 to 60 bushels, according to the season and the condition of the seed bed, while the weight is about 40 pounds to the measured bushel. His principal objection to this variety is that during the ripening period it is likely to be damaged by storms, as it shatters readily. An important characteristic of the variety, in his opinion, is that the grain will not heat in the bundle or in the bin. The fine, bright straw is readily eaten by sheep, horses, and cattle.

Utah.—Prof. J. C. Hogensen, agronomist of the Utah station, reports an average yield, under irrigation, of about 97 bushels to the acre from the Sixty-Day oat for the three years from 1906 to 1908. Other leading varieties averaged about 90 bushels for the same period. He says:

Sixty-Day is early and drought resistant and is considered a good oat in our State, especially for dry farms. It has a short stiff straw and does not lodge. Kherson has been grown only two years, but the yield is much lower than that of Sixty-Day.

On the Utah stations the Sixty-Day oat has made a very good showing, usually ranking as one of the leading varieties on these dry-land farms. At Nephi it has given a decidedly lower yield than Black American in a six-year test, but higher than that of other varieties. The average yield of Sixty-Day for the six years is about 23 bushels. Kherson has not been grown on these farms for a period long enough to indicate its value.

Washington.—Few tests of these varieties have been reported from Washington and Oregon. The experiment station at Pullman,

Wash., has grown the Sixty-Day oat for several years. Director Thatcher says:

It is a very satisfactory early oat and will be used quite extensively in the drier parts of the State. Kherson oats have not done as well with us as other varieties. Swedish Select and the black oats, supplied to us by the Bureau of Plant Industry several years ago, are giving us the best results in regions of 18 inches or more of rainfall.

Oregon.—H. H. White, of Sherman County, has grown the Sixty-Day oat since 1906. In 1908 he reported:

This is not an oat country. My neighbors thrashed 3 to 8 sacks (7 to 20 bushels). Mine went 12 sacks (30 bushels). I received 64 pounds of seed from the Department in 1906, which was sowed on 2 acres of measured land. The yield was 67 bushels. Most of this crop was sowed on 40 acres at the rate of 40 pounds to the acre. My crop this year was 478 sacks (1,075 bushels). My neighbors bought almost all of the crop for seed. This is the oat for here, as it gets ripe before the hot weather hits us.

COMPARISON OF SIXTY-DAY AND KHERSON OATS.

An opportunity for a comparison of the merits of the Sixty-Day and the Kherson oats is afforded by the figures given in Table II. In this table strictly comparable tests from fourteen stations are reported. The duration of the tests varies from two to seven years and averages four years.

TABLE II.—*Comparison of the yields of the Sixty-Day and the Kherson oats in fifty-five tests at fourteen agricultural experiment stations for periods averaging four years.*

Station.	Number of years tested.	Sixty- Day.	Kherson.
Lafayette, Ind.....	5	44.86	41.66
Madison, Wis.....	4	58.30	56.40
St. Anthony Park, Minn.....	4	58.03	56.74
Ames, Iowa.....	5	45.20	55.10
Edgeley, N. Dak.....	4	37.60	37.10
Brookings, S. Dak.....	3	48.40	49.10
Bellevue, S. Dak.....	2	36.30	36.40
Lincoln, Nebr.....	7	52.50	55.30
Manhattan, Kans.....	6	41.79	41.43
McPherson, Kans.....	3	35.38	32.60
Amarillo, Tex.....	3	24.37	18.61
Bozeman, Mont.....	5	78.80	82.00
Philbrook, Mont.....	2	52.40	50.50
Akron, Colo.....	2	38.65	45.60
Average		48.26	49.13

The Sixty-Day oat has given a higher yield than the Kherson at eight of the stations, viz, Lafayette, Ind., Madison, Wis., St. Anthony Park, Minn., Edgeley, N. Dak., Manhattan and McPherson, Kans., Amarillo, Tex., and Philbrook, Mont. At the remaining six, Ames,

Iowa, Brookings and Bellefourche, S. Dak., Lincoln, Nebr., Bozeman, Mont., and Akron, Colo., Kherson has given the better yield. The average of the 55 tests is 48.26 bushels for Sixty-Day and 49.13 bushels for Kherson.

CONCLUSIONS.

In the corn belt, which is also the area of greatest oat production, those varieties of oats which mature early give the best yields.

The most satisfactory type of early oats now grown in this country is that represented by the Sixty-Day and the Kherson.

These two varieties, which are practically identical, were both introduced from southern Russia, the Kherson by the Nebraska Agricultural Experiment Station and the Sixty-Day by the United States Department of Agriculture.

The principal points in their favor are their early maturity, heavy yield, low proportion of hull, and resistance to lodging.

Their principal defects are the small size and the yellow color of the berry.

The Sixty-Day and the Kherson oats have given best results in the corn belt and on the dry farms in the Great Plains and Intermountain districts.

Larger, later varieties usually give higher yields in the Northern States and in irrigated districts.

